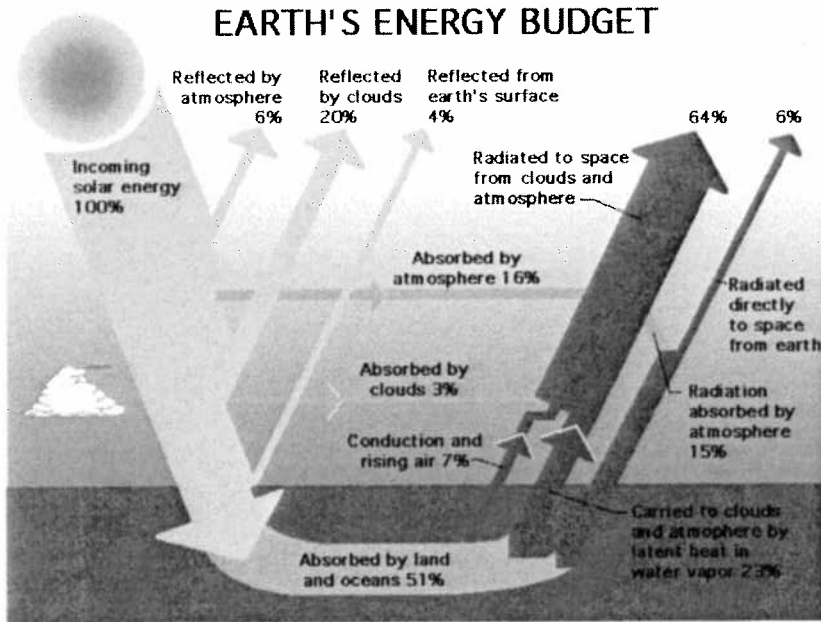


## Earth's Energy Budget

The Earth receives only a very small portion of the sun's energy, yet this energy is responsible for powering the motion of the atmosphere, the oceans, and many processes at the Earth's surface. The Earth's climate system constantly tries to maintain a balance between the energy that reaches the Earth from the Sun and the energy that is emitted to space. This is referred to as the Earth's "radiation budget".



Look at the Earth's Energy Budget diagram and answer the following questions.

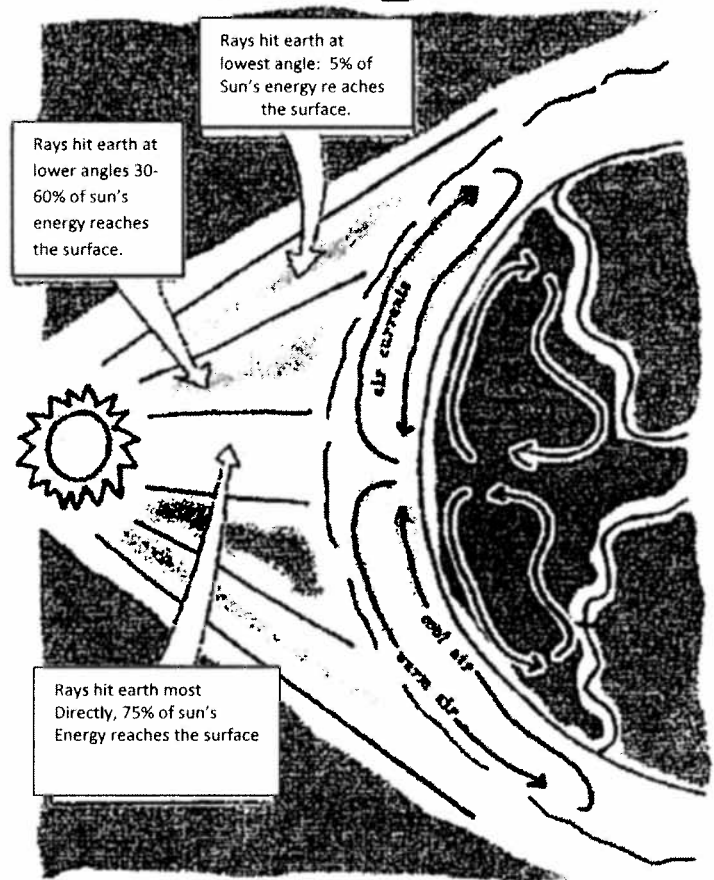
8. Determine the radiation budget by looking at the Earth's Energy Budget. (Subtract the amount of solar energy from the total amount of reflected energy from the Earth's in order to determine the radiation budget).
9. What is the total percentage of the incoming solar energy reflected from the Earth by the atmosphere, clouds, and Earth's surface?
10. Is the total percentage of the incoming solar energy reflected from the atmosphere, clouds, and Earth's surface less than or greater than the incoming solar energy absorbed by the land and ocean?
11. If the amount of incoming solar energy reflected from the Earth's surface tripled, how much energy would be reflected?
12. What is the total percentage of absorbed energy by the atmosphere, clouds, and land and oceans?
13. What is the total percentage of energy radiated from the clouds and atmosphere and directly to space from earth?

## Up and Down, and all around!

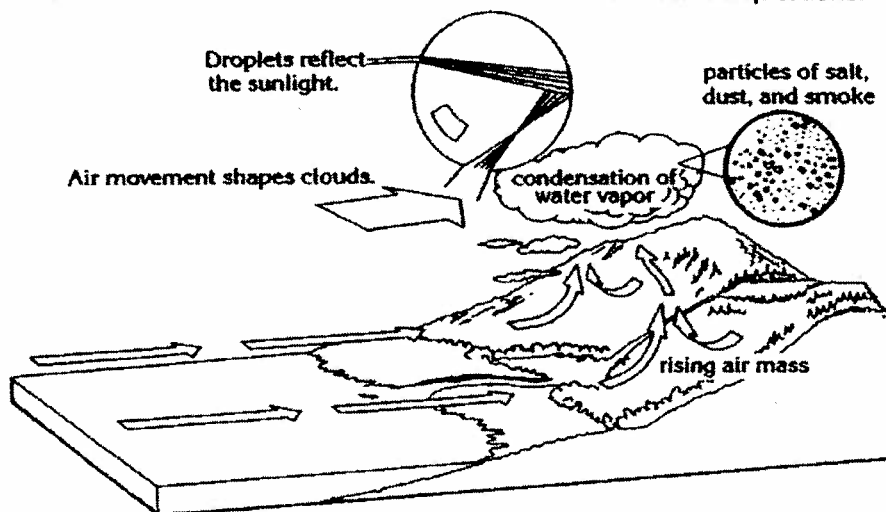
Use the diagram to fill in the paragraph.

At the equator, \_\_\_\_\_ air rises. Some of this warmth is trapped by the \_\_\_\_\_, while the rest continues up through the atmosphere and into \_\_\_\_\_. The warm, trapped air travels \_\_\_\_\_ or \_\_\_\_\_ over top of cooler air that moves along the earth towards the \_\_\_\_\_ to fill the gap left by the rising \_\_\_\_\_ air. As the warm air higher in the atmosphere starts to cool, it will begin to \_\_\_\_\_ to earth again- north or south would even be chillier than it is! These air currents-or winds-also help move \_\_\_\_\_ ocean water from the equator into the \_\_\_\_\_ regions, which is another way of keeping the North a little bit warmer. This movement of cold and warm air creates air \_\_\_\_\_ at the local level as well. Have you seen birds hanging in the air without flapping? They are taking advantage of the rising warmer air, called \_\_\_\_\_. Dropping cool air can create \_\_\_\_\_. The difference in \_\_\_\_\_ energy levels causes a temperature difference between the \_\_\_\_\_ and the \_\_\_\_\_. This temperature difference causes oceanic and atmospheric \_\_\_\_\_. Ocean \_\_\_\_\_ are caused by winds, differences in temperature, and differences in salinity. \_\_\_\_\_ water is denser than \_\_\_\_\_ water. \_\_\_\_\_ water is denser than \_\_\_\_\_ water. \_\_\_\_\_ water near the poles is denser and tends to \_\_\_\_\_.

### Convection and currents:



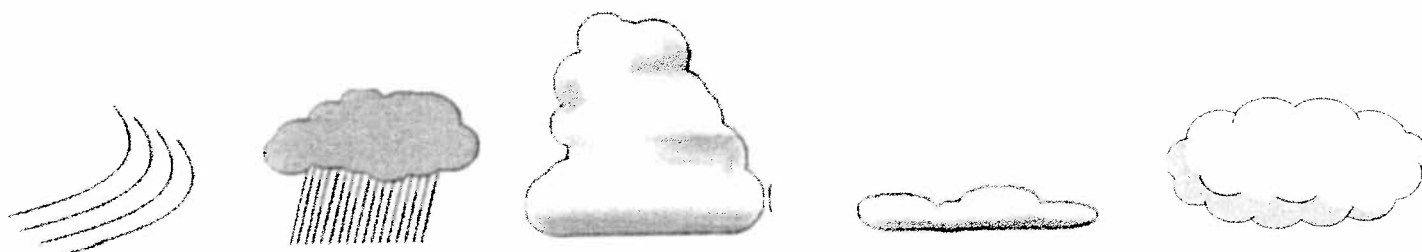
Clouds are formed when rising air is cooled and the water vapor condenses on tiny particles in the air. The tiny water droplets are so small they remain suspended in the air. Use the illustration to answer the questions.



1. Water from the earth's surface moves into the air by \_\_\_\_\_ and becomes \_\_\_\_\_.

2. The rising air mass becomes cooled and the water vapor \_\_\_\_\_.
3. What are the probable sources of each of these particles found in the atmosphere?
  - a. salt \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. smoke \_\_\_\_\_
4. Why do the cloud droplets not fall to the earth as soon as they are formed?
5. Why can we see a cloud?
6. What causes the shape of a cloud?

Name the following clouds and the weather associated with each.



### B. Precipitation

Precipitation is water vapor that condenses and falls to the earth. Depending on the conditions in the atmosphere, precipitation can fall in a number of forms. Identify each form of precipitation by drawing its symbol next to its description.

Symbols	
rain	
drizzle	
rain showers	
sleet	
snow	
hail	
fog	

Symbol	Definition
	Clouds that form close to the ground.
	Droplets that freeze as they get closer to the ground.
	Light mist of droplets falling to the earth.
	Droplets of water freeze around ice crystals as they bounce up and down within a storm cloud. Fall to earth when they get heavy.
	Vapor that changes directly into crystalline flakes because of freezing temperatures.
	Water vapor that forms droplets and falls to the earth.
	Large amount of droplets falling to the earth.

## XI. Weather

### A. Fronts

A front is a boundary where different air masses meet but do not mix. Write the words from the word bank in the correct blanks to match each type of front with its definition.

Cold front  
Stationary front

Warm front  
Occluded front

1. \_\_\_\_\_ A warm air mass slides over a cold air mass. This type of front can cause precipitation in the form of rain, sleet, or snow.
2. \_\_\_\_\_ Colder air forces warm air upward, which closes off warm air from Earth's surface.
3. \_\_\_\_\_ A cold air mass and a warm air mass move toward each other. The warm air gets lifted over the top of the cold air and forms clouds. This often results in heavy rain or snowstorms.
4. \_\_\_\_\_ Neither cold air nor warm air advances or moves. Where the two fronts meet, temperatures do not change and gentle winds occur.

### C. Weather Maps

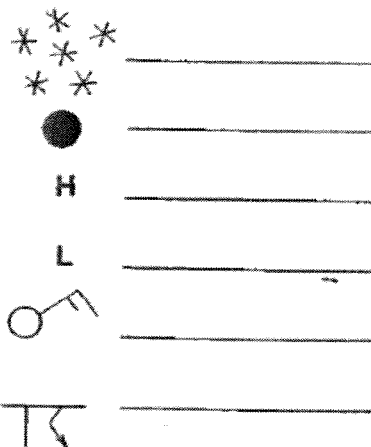
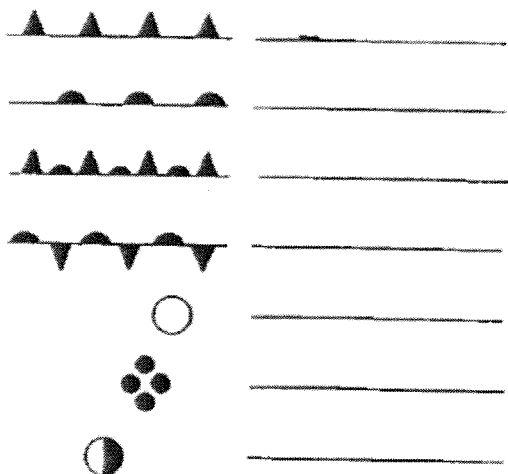
Weather maps provide data from which meteorologists prepare weather forecasts. To accurately read a weather map you must be able to understand the weather map symbols. Label each of these weather map symbols using the word bank.

Rain  
Snow  
High pressure  
Wind speed & direction

Clear skies  
Partly cloudy  
Warm front

Thunderstorm  
Cold front  
Stationary front

Cloudy  
Occluded front  
Low pressure



## XII. The Atmosphere

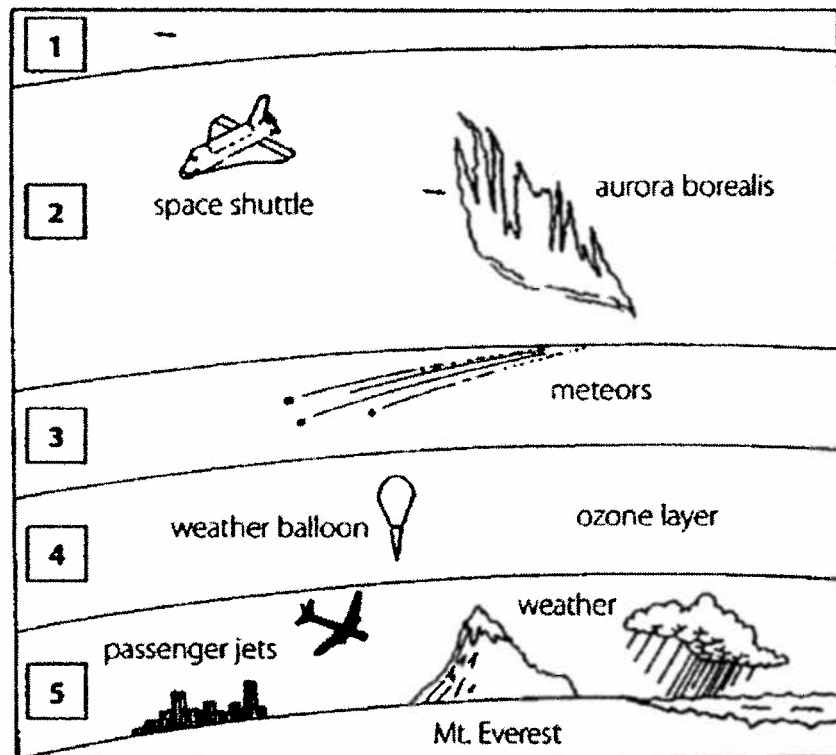
The atmosphere is made up of layers that have distinct characteristics. Temperature decreases as altitude increases in the lowest layer of the atmosphere. Most of the air that makes up the atmosphere is found in the troposphere. Virtually all weather takes place there.

### A. Way Up in the Sky

Directions: Write each layer of the atmosphere from the word bank in the correct blank to label the diagram. Then write each term next to its correct description below.

Stratosphere  
Mesosphere  
Thermosphere  
Exosphere  
Troposphere

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_



6. \_\_\_\_\_ layer containing high temperatures due to absorption of the sun's rays
7. \_\_\_\_\_ layer closest to Earth's surface; contains 90% of the atmosphere's total mass; all weather occurs here
8. \_\_\_\_\_ coldest layer of the atmosphere; located above the stratosphere
9. \_\_\_\_\_ layer above the troposphere that contains ozone
10. \_\_\_\_\_ outermost layer of the atmosphere; contains almost no air molecules

6.8 The concepts developed in this standard include the following:

- The solar system consists of the sun, moon, Earth, other planets and their moons, meteors, asteroids, and comets. Each body has its own characteristics and features.
- The distance between planets and sizes of the planets vary greatly. The outer, "gas" planets are very large, and the four inner planets are comparatively small and rocky.
- Gravity is a force that keeps the planets in motion around the sun. Gravity acts everywhere in the universe.